The prognosis depends on hyperammonaemic episodes—several children do well until a fatal crisis.[1] The intellectual prognosis may not only depend on the neonatal coma: a case report[2] and work on female carriers[6] suggest that later episodes are important. In these, unless there is vomiting, the gavage pump should stop the rapid deterioration due to anorexia and so reduce severity.

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Candida albicans skin abscesses

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SUMMARY Two neonates who developed *Candida albicans* skin abscesses are described. One developed disseminated infection. In the newborn abscesses cannot be assumed to be of bacterial origin.

Infection is a major cause of morbidity and mortality in the neonatal intensive care unit. *Candida albicans* is well recognised as a pathogen in the neonate, being responsible for infections ranging from superficial dermatitis to systemic candidiasis.[1] Increased use of broad spectrum antibiotics and prolonged periods of intravenous cannulation for parenteral nutrition in newborn infants have increased the incidence of the latter. Although candida skin abscesses have been described in an infant[2] and in adults,[3] they have not been previously reported in a neonate. We describe the occurrence of multiple skin abscesses in two neonates undergoing intensive care.

Case reports

Patient 1. A boy weighing 1·53 kg at 30 weeks' gestation required ventilation from birth for severe hyaline membrane disease. During his first 24 hours he had persistent fetal circulation treated by tolazoline infusion; he also had a patent ductus arteriosus which was successfully treated with indomethacin. His total period of ventilation was 47 days after which he was oxygen dependent due to bronchopulmonary dysplasia. He received total parenteral nutrition while being ventilated.

At age 5 weeks he had septicaemia due to *Staphylococcus epidermidis* which was treated with gentamicin and ampicillin. At age 6 weeks three abscesses developed on his forehead, left wrist, and upper right arm. Each was aspirated and immediate Gram stain and culture of the aspirate were carried out. The Gram stain showed polymorphs, amorphous debris, and numerous yeasts, many showing pseudohyphae (Figure). Culture showed a pure growth of *C albicans*. Swabs taken from the skin overlying the abscesses did not contain yeast nor was the baby colonised by yeasts at other sites. Blood and cerebrospinal fluid cultures taken at this time were negative. He was treated with oral ketoconazole (5 mg/kg/day). One week later he developed signs of systemic infection and cultures of both blood and cerebrospinal fluid grew *C albicans*. No ocular signs of infection were observed on direct ophthalmoscopy. His treatment was changed to

Figure *Gram stained film of aspirate from patient 1. Yeasts with pseudohyphae are shown.*

intravenous amphotericin B (500 μg/kg/day) and flucytosine (100 mg/kg/day). He had a 6 week course. As a result of his meningitis he developed obstructive hydrocephalus which required insertion of a Hakim ventriculoperitoneal shunt. Serum immunoglobulins and total white cell counts were within normal limits. Candida precipitins were detected in his serum two months after his abscesses developed. Both during and after infection he had low C_3 and C_4 values (0·68 g/l and 0·08 g/l, respectively). Despite successful treatment of his infection he died aged 6 months from cor pulmonale.

Patient 2. A boy of 28 weeks' gestation weighing 1 kg developed hyaline membrane disease and required ventilation for 10 days. Flaccid paralysis of his lower limbs and bladder developed, possibly secondary to umbilical artery catheterisation. He received two courses of broad spectrum antibiotics in his first four weeks because of suspected septicaemia and necrotizing enterocolitis. At age 5 weeks *C albicans* was grown from his urine. The yeast was sensitive to flucytosine and intravenous treatment was started (100 mg/kg/day). Despite this the yeast was repeatedly isolated from the urine. At age 12 weeks an abscess developed on his forearm. An aspirate of the abscess revealed polymorphs and yeasts showing pseudohyphae. A pure growth of *C albicans* was obtained. Blood and cerebrospinal fluid cultures were negative. Because of our experience with the previous patient, intravenous treatment with amphothericin B (500 μg/kg/day) and flucytosine (100 mg/kg/day) was begun and was continued for 6 weeks at the end of which time all cultures, including urine, were sterile. White cell counts and immunoglobulin and complement values were all within normal limits. One month after the abscesses formed he developed serum candida precipitins. He was discharged at age 5 months.

Discussion

Skin abscesses in the neonate are frequently the result of local infection due to the use of intravenous cannulae. *Staph aureus* and *Staph epidermidis* are most commonly isolated. *C albicans* is a rare cause of skin abscesses. In the first patient the abscesses were close to sites of previous intravenous infusions and could have been caused by local introduction of yeasts beneath the skin, but in the second this was not so and haematogenous spread was more likely. In both infants the presence of pseudohyphae indicated active replication of yeasts at the site of the abscess rather than simple colonisation of an abscess cavity caused by another organism. No signs of deeper involvement such as osteomyelitis or arthritis at the site of the abscesses were found.

Our experience indicates that skin abscesses in the newborn cannot always be assumed to be of a bacterial origin. All should be aspirated and a Gram stain and culture carried out. If candida is the organism responsible and pseudohyphae are seen on Gram film systemic treatment with appropriate antifungal agents is required.

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